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Quantifying Sexual Orientation Among Homeless and Unstably Housed Women in a Longitudinal Study: Identity, Behavior, and Fluctuations Over a Three-Year Period

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Abstract

Sexual orientation has been linked to certain health conditions, yet quantifying sexual orientation in longitudinal studies is challenging. This study examined different methods of accounting for sexual orientation in a cohort study of 300 homeless and unstably-housed women followed every 6 months over 3 years. Altogether, 39.7%(*n*=119) could be considered sexual minority at one or more time points based on identity and/or behavior; 16.3%(*n*=49) reported shifts in sexual identity. Only 24.0%(*n*=72) were identified through a single measure of sexual identity, 27.0% (*n*=81) were identified with a single measure of identity and behavior, 33.0% (*n*=99) were identified through annual measures of identity and behavior, and 22.0–22.3% (*n*=66–67) were identified through latent class analysis including all identity/behavior measures. This study found that sexual fluidity is common in unstably housed women, and many sexual minority women would be missed in longitudinal studies with different methods of accounting for sexual orientation.

Keywords

sexual orientation; fluctuation; sexual identity; sexual behavior; women; homelessness; lesbian; bisexual

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Introduction

Sexual minority individuals (i.e., individuals who are not heterosexual with respect to identity, behavior, or some other component of sexual orientation) are at greater risk for a variety of poor health outcomes including substance use (McCabe, Hughes, Bostwick, West, & Boyd, 2009), mental health problems (King et al., 2008), and physical health problems (Lick, Durso, & Johnson, 2013) and factors that influence health such as homelessness (Corliss, Goodenow, Nichols, & Austin, 2011) and trauma (Roberts, Austin, Corliss, Vandermorris, & Koenen, 2010). The Institute of Medicine (2011) has recognized that the measurement of sexual orientation is critical to understanding health. However, the measurement and reporting of sexual orientation in health research studies continues to be neglected (Flentje, Bacca, & Cochran, 2015; Heck, Mirabito, LeMaire, Livingston, & Flentje, 2017). While large health research data collection efforts have begun to incorporate measures of sexual orientation (Baker & Hughes, 2016), very few research studies report or account for participant sexual orientation (Flentje et al., 2015; Heck et al., 2017). Challenges to measuring and reporting sexual orientation in research studies include the multidimensionality of the construct of sexual orientation (Sell, 1997), consisting of, at minimum, identity and behavior, and up to seven dimensions (Klein, Sepekoff, & Wolf, 1985), along with the potential for discordance among these dimensions. Among the rare studies that report sexual orientation, most only report a single dimension, which is commonly sexual identity (Flentje et al., 2015).

Reporting and accounting for sexual orientation in longitudinal research studies is further complicated by substantial evidence of fluctuation in sexual orientation over time (Diamond, 2000; Diamond, 2012; Fergusson, Horwood, Ridder, & Beautrais, 2005; Katz-Wise & Hyde, 2015). Research on variability in sexual orientation has challenged conventional assumptions that sexual orientation is a relatively stable construct that forms early in life, progresses over sequential developmental stages (Katz-Wise & Hyde, 2015), and requires congruity amongst identity, attractions, and behaviors (Rosario, Schrimshaw, Hunter, & Braun, 2006). Fluctuations in sexual identity and behavior, also termed sexual fluidity, have been documented throughout the lifespan (Diamond, 2008; Dickson, van Roode, Cameron, & Paul, 2013; Mock & Eibach, 2012; Ott, Corliss, Wypij, Rosario, & Austin, 2011; Savin-Williams, Joyner, & Rieger, 2012). Sexual fluidity appears to be a characteristic of human sexuality itself, particularly for women, rather than a series of temporary anomalies on a path to a stable sexual orientation (Diamond, 2000, 2012; Katz-Wise & Hyde, 2015; Fergusson et al., 2005). Evidence suggests that women change both sexual identity and behavior, depending on context and choice, and may maintain inconsistencies between their public identity and their sexual behavior (Diamond, 2008). Given the centrality of sexual orientation to health and well-being, understanding its fluctuations will subsequently facilitate a better foundation for health research.

Longitudinal cohort studies have revealed sexual fluidity among women beginning in adolescence and, in some cases, continuing into middle adulthood (e.g., Diamond, 2008; Dickson et al., 2013; Mock & Eibach, 2012; Ott et al., 2011; Savin-Williams et al., 2012). For example, within one cohort, one in six women changed their sexual identity from their early twenties (M age = 21.96) to late twenties (M age = 28.53, Savin-Williams et al., 2012).

In her groundbreaking ten-year longitudinal study, Diamond (2008) found that two-thirds of sexual-minority women experienced a fluctuation in their identity and 36% experienced multiple changes in their identity. Fluidity in sexual identity has been observed to persist into middle age, with nearly two-thirds of homosexual-identifying and bisexual-identifying women reporting a different sexual identity between their mid-40s and mid-50s (Mock & Eibach, 2012).

Moreover, individual changes in sexual orientation over time are not always changes from heterosexual to sexual minority statuses. Teenagers, both male and female, from a nationally representative study who reported same-sex attraction or behavior when first surveyed were not consistently the same ones who reported same-sex attraction or behavior a year later, nor did they necessarily report a sexual minority orientation (whether by identity, attraction, or behavior) five years later (Savin-Williams & Ream, 2007). The same was true of women reporting some form of sexual minority identity at ages 32 and 38 within a birth cohort study in New Zealand (Dickson et al., 2013). While bi-directional change has been noted, Savin-Williams et al. (2012) observed that changes in women's sexual identity in their 20s were more common among women who started out with some form of sexual minority identity (mostly heterosexual, bisexual, homosexual) than among those who identified as 100% heterosexual.

Sexual orientation may also be impacted by social or economic environments. Among women who are unstably housed, sexual orientation may be determined by necessity in meeting subsistence needs, as unstable housing can be a predictor of more sexual partners (Wenzel, Tucker, Elliott, & Hambarsoomians, 2006). In cases such as this, women may be compelled to be sexually active with partners in order to meet basic needs rather than to partner for other reasons, which may in turn change sexual behavior and/or the understanding of one's sexual identity. Of note, sexual minority people are also overrepresented among homeless populations, with previous research documenting much higher rates of homelessness among sexual minority youth (Corliss et al., 2011) and an overrepresentation of sexual minority adults experiencing homelessness in an urban environment (Flentje, Leon, Carrico, Zheng, & Dilley, 2016). This suggests that sexual orientation and sexual orientation fluctuation may be different among people who are homeless or unstably housed, may be worth consideration due to an overrepresentation of sexual minority people among people experiencing homelessness, and thus should be investigated separately among this population.

While health risks for conditions including sexually transmitted infections (Everett, 2013) and substance use (McCabe et al., 2009) have been linked to sexual orientation, the role of changes in sexual orientation is not as clear. Moreover, the role of behavior and identity change within a larger complex system for understanding health risks is also unclear. Models of population health and vulnerability have established socioeconomic status as a central determinant of health (Ahern, Galea, Hubbard, & Karpati, 2008; Galea, Ahern, & Karpati, 2005; Karpati, Galea, Awerbuch, & Levins, 2002), in parallel with individual, social and environmental contextual factors (Galea, Ahern, & Vlahov, 2003). Newer complex systems approaches to health recognize that (1) biological, behavioral and group level factors may all influence health, and (2) the interrelation between these factors involves dynamic feedback

and change over time (Galea, Riddle, & Kaplan, 2009). Adopting a complex systems dynamic model to better understand health in low-income populations first necessitates an understanding of the individual components going into the model, and then how these components come together in more complex ways (e.g., reciprocal relations and interrelation) to ultimately cause poor health outcomes. The ability to purposefully investigate the components that are related to health such as sexual orientation and socioeconomic status requires a better understanding of the fluctuations in sexual orientation that occur among people who are of low socioeconomic status.

While studies have begun to consider the links between health outcomes or risks and sexual orientation in concert with other social factors (e.g., access to preventative health care, Mays, Yancey, Cochran, Weber, & Fielding, 2002; ratings of health, Veenstra, 2011; or mental health and substance use, Flentje, Shumway, Wong, & Riley, 2017); it remains unclear how to account for sexual identity or behavior that may change over time. While there is compelling evidence of the phenomenon of sexual fluidity, measuring this phenomenon has proven challenging. Measurement is further complicated as researchers attempt to account for both the multiple components by which sexual orientation is typically defined (McCabe et al., 2009), as well as the time frame in which sexual orientation is measured and its variability over time. What remains to be developed is clarity on how to account for sexual orientation over time within longitudinal research, particularly given the potential for incongruence and changes in the dimensions of sexual orientation over time. Only then can sexual orientation be adequately accounted for and understood within a system which identifies health risk.

This study uses data collected from the Shelter, Health, and Drug Outcomes among Women (SHADOW) study, a cohort of women experiencing housing instability (i.e., homelessness, sleeping in shelters, in public, or staying at other people's houses) in the San Francisco Bay Area who were followed over the course of three years beginning in 2008–2010. At regular interviews every six months, participants were asked about their sexual activity over the previous six months as well as their then-current sexual identity. These data add to previous research in several important ways. First, whereas most studies in which sexual orientation was tracked over time consisted of homogeneous samples in terms of age (Dickson et al., 2013; Fergusson et al., 2005), with the majority focused on adolescence and emerging adulthood (Diamond, 2003, 2008; Katz-Wise et al., 2017; Ott et al., 2011; Savin-Williams et al., 2012; Savin-Williams & Ream, 2007), this study included women from across the age spectrum including a substantial proportion of women in middle adulthood. Second, this study was composed of women experiencing poverty and homelessness, a population for which, to our knowledge, sexual orientation and fluctuations in sexual orientation have not been previously investigated. Third, while other longitudinal studies have spread out measures of sexual orientation by years at a time, this study permitted us to record sexual activity and sexual identity for a continuous three-year period with measures of sexual orientation every six months, permitting a more granular examination of sexual orientation over time. As such, these data also allow us to better understand more minute variations in the synchrony or discordance of identity and behavior. Finally, the sample of women examined in this study was selected irrespective of their declared sexual orientation.

The purpose of this study was to characterize sexual orientation among homeless and unstably housed women by assessing changes in sexual identity and behavior including the frequency of fluctuation as well as discernable patterns of fluctuation. Furthermore, we sought to explore the implications of different approaches to quantifying sexual orientation over time in order to identify sexual minority women within a longitudinal research study. We sought to explore the implications of different approaches by examining who is captured or not captured as sexual minority with a single measure of sexual identity, a single measure of sexual identity and behavior, and annual or biannual measures of sexual identity and behavior. We also sought to examine the implications of the use of a latent class analysis that takes into account identity and behavior across all time points in identifying sexual minority women.

Method

This study employed secondary analysis of data from SHADOW, a cohort study investigating health risks and HIV among homeless and unstably housed women in the San Francisco Bay Area (Riley et al., 2014). Three-hundred individuals assigned female sex at birth, with a history of homelessness or unstable housing, were enrolled in the cohort between 2008 and 2010. Study participants were followed every 6 months for a total of 7 time points over a follow-up period of up to 3 years from recruitment date. Due to the aims of the parent study, HIV-positive women were oversampled so that they comprised 50% of the total cohort. Recruitment methods targeted women from homeless shelters, low cost hotels, and free meal programs and were based on recruitment methodologies developed by Burnam and Koegel (1988) to recruit a representative sample of homeless individuals.

Measures

Sexual orientation - defined by reported sexual identity and sexual behavior - was measured at each study visit. Identity measures consisted of a forced choice question wherein women were asked how they identified their sexual orientation, with the following response options: 1) heterosexual, you prefer to have sex with men; 2) homosexual/lesbian, you prefer to have sex with women; 3) bisexual, you do not prefer sex with one over the other; 4) refuse to answer. In the same study visit, participants were queried about sexual behavior in a two-step process in which they were asked first about their number of sexual partners in the previous 6 months and second, how many of these partners were men. Sexual behavior with men was defined as the reporting of one or more male sexual partners in the previous 6 months, while sexual behavior with women was defined as the occurrence of one or more non-male sexual partners in the previous 6 months. Participants were classified at each time point as having sexual behavior with men only, sexual behavior with women only, sexual behavior with men and women, or no sexual behavior.

Analysis

Patterns of shifts in sexual identity and behavior.—Individuals who had shifts in sexual identity and behavior were identified. Changes in sexual identity and behavior across the 7 time points (comprising 3 total years) were manually coded using content analysis (Elo & Kyngäs, 2008). Individuals who had a shift in sexual identity or behavior across the time

points were selected, and the patterns of shifts were examined by two research assistants. These research assistants, along with the lead author, determined categories that described the types of shifts observed. They then determined whether or not a participant met the criterion or criteria for each category in order to quantify some of the types of shifts observed. When the two research assistants had a disagreement in coding, they, along with the lead author, examined each of the patterns and discussed them to resolve the discrepancy. Chi-square analyses and a paired samples t-test were used to examine whether or not individuals who changed their report of their sexual identity versus those who did not differed by race, HIV status, or age.

Latent class analysis using longitudinal sexual orientation and behavior.—In order to identify how statistical modeling would quantify sexual orientation over time, taking into account both identity and behavior, we conducted a latent class analysis to account for unobserved classes based on sexual orientation. The latent class analysis was conducted using Mplus (Muthén, L.K. & Muthén, B.O., 2015) to separate individuals into probable sexual orientation groups using sexual identity and behavior (i.e., sexually active with men, sexually active with women) across 7 time points. Model selection was based on multiple criteria including: the minimization of the Bayesian information criteria (BIC) as it is supported as the best indicator of the number of classes (Morgan, 2015; Nylund, Asparouhov, & Muthén, 2007), the *p* value of the bootstrap likelihood ratio test becoming no longer significant, and the class sizes remaining large enough to be meaningful. The Vuong-Lo-Mendell-Rubin likelihood ratio test was also calculated. After the classes were identified, sexual identity and behavior within each predicted class were examined. Patterns of sexual identity and behavior within the classes were then quantified and described. When describing the classes, “mostly” reflects the most commonly reported sexual identity or behavior, “substantial” quantifies a category that at least 25% of respondents in a category endorsed, “some” quantifies a category that at least 5% of participants within that class endorsed, while “only” describes that it was the exclusive category endorsed by individuals in a class.

Results

Participants

The average age of the sample was 47.5. Participants were largely African American, White and Multiracial (Table 1). At baseline, 76% (*n*=228) of participants reported sexual identity as heterosexual, 7.3% (*n*=22) as lesbian, and 16.7% (*n*=50) as bisexual. In terms of baseline sexual behavior, sex with men only was reported by 60.7% (*n*=182) of participants, sex with women only was reported by 4.0% (*n*=12) of participants, sex with both men and women was reported by 6.3% (*n*=19) of participants, and no sex within the prior 6 months was reported by 29.0% (*n*=87) of participants. In total, 27.0% of participants (*n*=81) could be considered sexual minority at baseline due to either identity or behavior, while 39.7% of the study population (*n*=119) could be considered sexual minority at one or more time points during the study due to either identity or behavior. Specifically, across all time points 30.0% (*n*=90) of participants endorsed a sexual minority identity (*i.e.*, lesbian or bisexual identity) and 22.3% (*n*=67) were considered sexual minority due to behavior (*i.e.*, sexual behavior

with women) at one or more time points. The percentage of participants who were identified as sexual minority at each time point through either identity or behavior ranged from 20.3% to 27.7% of those who participated at each time point.

As reported elsewhere, the sample had very high rates of victimization, with 60% having experienced emotional, physical, or sexual violence within the previous 6 months, and 27% reporting recent sexual victimization (Riley et al., 2014). Nearly all (97%) of the participants screened positive for a psychiatric disorder, with 85% having at least one substance use disorder (Riley et al., 2014). Lesbian and bisexual identity at the first study visit was related to greater risk of psychiatric comorbidity (Flentje et al., 2017).

Changes and Patterns of Changes in Sexual Identity and Sexual Behavior over Time

Considering all of the possible 7 time points when sexual orientation was reported, 16.3% (n=49) of women reported changes in sexual identity. Identity changes are illustrated in Figure 1, which shows that there is substantial heterogeneity in the way in which identity changes occurred within the sample. Table 1 shows that at baseline, 5.0% (n=15) of study participants reported a current sexual identity that was different from current sexual behavior: 3.0% (n=9) of participants endorsed heterosexual identity and sexual behavior with men and women, 1.0% (n=3) of participants endorsed lesbian identity and sexual behavior with men only, and 1.0% (n=3) of participants endorsed lesbian identity and sexual behavior with men and women. Race was associated with changing identity over the study period ($\chi^2[4]=13.91$ $p = 0.008$). Further examination showed that 10% (n=1) of women who identified as Asian, 12.3% (n=16) of women who identified as Black, and 12.2% (n=11) of women who identified as White had changes in identity, while 20% (n=3) of Latina women and 32.7% (n=18) of women who identified their race as multiracial or “other” reported changes in sexual identity. Women who did or did not report changes in sexual identity did not differ by age (M= 47.4 for those who did not change identity versus 45.0 for those who reported identity shifts, $t[298]=1.79$, p=.07) nor HIV status (16.9% of those who changed identity were HIV negative while 15.8% were HIV positive, $\chi^2[1]= 0.07$ $p = 0.80$).

Using manual coding by research assistants, patterns of sexual identity and behavior changes were examined. When looking only at sexual identity, 7.7% (n=23) of women had one single sexual–identity change. More than one change between 2 sexual identities (e.g., a woman identified as heterosexual at time 1–3, then as bisexual at time 4, then back to heterosexual at time 5) occurred in 8.3% (n=25) of women. Only 1 woman reported changes between all three sexual identities across the 3-year period. Among women within this study, 3% (n=9) of women exhibited identity changes that were consistent with changes in sexual behavior (e.g., a woman begins having sex exclusively with women and her identity shifts to lesbian), while 1.3% (n=4) of women exhibited identity changes that were inconsistent with their changes in sexual behavior (e.g., women would continue to have sex only with men but would change their identity to lesbian). Twenty-two women (7.3%) had a change in sexual behavior but continued to maintain a static sexual identity (e.g., women reported sexual behavior with women but maintained a constant heterosexual identity).

Latent Class Analysis Using Longitudinal Sexual Identity and Behavior

The latent class analysis results are reported in Table 2. Compared to the 6 and 5-class solution, the 4–class solution best minimized the Bayesian information criteria (BIC). Both the 4– and 5–class solutions are described here, as the 5–class solution still maintained sizeable numbers of individuals within classes and was the last class before the bootstrap likelihood ratio test rose above p<.01. In all solutions, the Vuong-Lo-Mendell Rubin likelihood ratio test was greater than p=.01, but the bootstrap likelihood ratio test has been shown to be a better predictor of class size (Nylund et al., 2007). The identities and sexual behavior of the individuals within each class were then examined and are summarized within Figure 2, which provides visualization of the identities and behaviors that were most represented in each of the classes at each of the time points. Briefly, within the 4–class solution, class 1 (n=43) was primarily bisexual in identity, with sexual behavior represented from all categories (men only, women only, both, and no partners); class 2 (n=136) was primarily heterosexual, with sexual behavior primarily with male partners; class 3 (n=23) was primarily lesbian, with sexual behavior mostly with women; and class 4 (n=98) was primarily heterosexual with no sexual partners. Within the 5 class solution, class 1 (n=26) was mostly bisexual, with sexual behavior mostly with men; class 2 (n=21) was mostly bisexual, with sexual behavior within all of the categories; class 3 (n=98) was mostly heterosexual, with no sexual partners; class 4 (n=20) was primarily lesbian, with sexual behavior primarily with women or with no sexual partners; and class 5 (n=135) was mostly heterosexual with sexual behavior primarily with men. When comparing the two different class solutions to each other, the main difference found was that within the 5 class solution, the primarily bisexually identified group was subdivided into those who are sexually active with men, women, both, or neither, and those that are primarily sexually active with men. As can be seen from Figure 2, the classes are similar across the 4 and 5 class solution (*i.e.*, class 1 was similar in both solutions, class 2 was similar to 5, 3 was similar to 4, and 4 was similar to 3 in the 4 and 5 class solutions, respectively). Class 2 emerged in the 5 class solution as a new and different class, primarily as a subgroup from class 1 of the 4 class solution.

Analysis of Potential Implications

Of the 300 women in the sample, 39.7% (n=119) of women could be considered sexual minority over the 3 years as defined by either identity or behavior. When considering identity alone, 24.0% (n=72) identified as lesbian or bisexual at the first time point, and an additional 6.0% (n=18) identified as either lesbian or bisexual at one or more time points over the next 3 years. Thus a single measure of sexual identity would have not captured 6.0% of women who came to identify as sexual minority over the course of 3 years. If sexual identity and behavior were considered at the first time point, 27.0% (n=81) of women were identified as sexual minority. Of the 9 additional women who were identified as sexual minority when sexual behavior was taken into account in addition to sexual identity at the first time point, only 1 woman went on to later identify as lesbian or bisexual during the course of the study. Of the women who identified as heterosexual at the first time point, 32 (10.7% of the study population) engaged in sexual activity with women over the following 3 years. Of the 39.7% (n=119) of women who could be considered sexual minority over the 3 years (due to either identity or behavior), only 60.5% (n=72) of these women were captured by a single measure of identity. Of the 119 women who could be considered sexual minority

over the 3 years, 83.2% (*n*=99) were identified through identity or behavior when only annual, and not biannual, measurements of sexual identity and behavior were considered.

When considering how the latent class analysis captured sexual minority status in comparison to other measures, overall the 4 and 5 class solution classified 66 (22.0%) and 67 (22.3%) women, respectively, into classes that were predominantly sexual minority. Within the 4 class solution, the two classes that were designated as primarily heterosexual included 32 and 21 women (within classes 2 and 4 respectively) who would be considered sexual minority at one or more time point due to behavior or identity. Within the 5 class solution, the two classes that were primarily heterosexual included 22 and 30 women (within classes 3 and 5, respectively) who were considered sexual minority at one or more of the time points due to behavior or identity. All of the women in the classes that were primarily lesbian or bisexual within both solutions contained only women who would be considered sexual minority at one or more time point due to behavior or identity. Thus, using the latent class analysis as the source of information to identify sexual minority women would result in 53 (17.7%) or 52 (17.3%) women who were not identified as sexual minority who otherwise endorsed a sexual minority identity or engaged in same-sex sexual behavior.

Discussion

The patterns we observed corroborate other research on sexual fluidity, substantiating evidence that sexual orientation accommodates inconsistencies between identity and behavior, is subject to change over time, is multi-directional (i.e., from heterosexuality to bisexuality to homosexuality and vice versa, or in any other sequence), and is experienced by both women who identify as heterosexual as well as those who identify as sexual minority. Our study utilized repeated measurement of sexual orientation. Repeated measurement of sexual identity and sexual behavior captured women as sexual minority who would not have been captured by a single time point measure. Specifically, both identity and behavior considered over 3 years identified just over 15% of the sample as sexual minority who would not have been identified by a single time point measure of sexual identity, which appears to be the most commonly documented dimension of sexual orientation within health research studies (e.g., among substance use research studies, Flentje et al., 2015). This is important when considering longitudinal data collection methods because demographic characteristics, such as sexual orientation, may only be recorded once within many longitudinal studies. The result of a methodological decision to record sexual orientation at only one time point is that sexual minority women may not be identified, even though sexual minority status may be an important factor to consider when examining health outcomes due to the observed health disparities among this population (Institute of Medicine, 2011). Given that sexual orientation has been linked to poor health outcomes, measurement at a single time point is likely underestimating its influence in many health-related studies. The Institute of Medicine (2011) has recommended that researchers who are designing studies consider and select measures of the dimensions of sexual orientation that are most relevant to study outcomes. Our results suggest that, rather than selecting a single dimension of sexual orientation, the routine collection of multiple dimensions may be a more valid approach in unstably housed populations.

When considering what to do with the collection of multiple dimensions of sexual orientation over time, it is clear that the decisions that are made have implications for who may be identified as sexual minority. Within our study we found that incorporating two dimensions of sexual orientation over multiple time points resulted in the identification of more sexual minority women. We also found that using a latent class analysis, which took into account both identity and behavior across all of the time points, to classify women into groups by likely sexual orientation categories resulted in fewer women being identified as sexual minority than would have been considered sexual minority at one or more time points due to behavior or identity. Specifically, over 17% of the women in our sample were classified into primarily heterosexual classes (i.e., not identified as sexual minority) using latent class analysis when they endorsed a lesbian or bisexual identity or engaged in same sex sexual behavior at one or more time points. It is possible that more sophisticated methods of accounting for sexual orientation, such as latent class analysis, may be better predictors in models considering health disparities. For example, it is possible that women who were classified as heterosexual through latent class analysis, who would have been classified as sexual minority through other methods, experience a health risk profile that is more similar to heterosexual women. Conversely, sophisticated methods such as latent class analysis may fail to identify sexual minority women and associated risk or protective health profiles. Decisions about how to measure sexual orientation within a specific research study should be informed by the purpose of the research. For example, sexual behavior may be more pertinent when examining HIV or STD risk, while sexual identity may be more pertinent when examining societal stress. Additionally, since both are rarely accounted for, it could be that together they are informative for understanding risk through a complex systems lens. Future research will be needed to identify which of these approaches is more valid in capturing sexual orientation or for assessing the likelihood of health disparities among women.

In our latent class analysis one category emerged that primarily represented sexual inactivity. This class included one third of the study participants. In a slightly older cohort study of middle aged and older women, Addis and colleagues (2006) found that 29% of women were sexually inactive in the prior year, suggesting that the class that emerged within our study may also be observed in other groups of women. Previous research has also found that unstably housed HIV-positive women may intentionally engage in abstinence from sexual activity (Courtenay-Quirk, Zhang, & Wolitski, 2009), which may be a reason for the existence of this class within our study. When considering how best to measure sexual orientation, it is important to consider the ramifications of sexual inactivity on measurement. Specifically, women who are sexually inactive may warrant their own category, or their sexual orientation may be missed by measurement that focuses primarily on behavior. While our study did not offer an identity response option of asexual, future research that includes this option would help to identify what proportion of people who endorse sexual inactivity would identify as asexual when it is offered. The fact that sexual identity change was observed during periods of sexual inactivity in this study indicates that studies of sexual orientation need to assess multiple dimensions of sexual orientation as discrete variables, as Diamond (2000) has suggested.

The external factors that may have been related to sexual orientation or shifts in orientation could not be determined with the available data and are beyond the scope of this study. However, in considering these results and their potential use in future complex systems approaches to health in vulnerable populations, it is important to consider the contextual factors that may have influenced these results. Sexual orientation may be impacted by social or economic environments, and the characteristics of our sample with respect to housing instability or homelessness, experience of sexual violence, HIV status, substance use, and cultural factors are potentially relevant to an understanding of sexual orientation. Given that unstable housing can be related to more sexual partners (Wenzel et al., 2006), sexual behavior may in turn influence one's understanding of one's sexual orientation, though the reasons for sexual behavior may be influenced by necessities of living rather than one's sexual desire or attraction. Extended periods of homelessness can be a predictor for the experience of rape among women (Meinbresse et al., 2014), and increased victimization, sexual or otherwise, may also be predictive of more sexual partners (Wenzel et al., 2006). To contextualize our results, as reported elsewhere, in our sample 27% of study participants reported experiencing some form of sexual violence in the previous six months, about three-quarters of which was perpetrated by a non-primary partner (Riley et al., 2014). Previous research has found that homeless sexual minority youth also have very high rates of sexual victimization (Cochran, Stewart, Ginzler, & Cauce, 2002). All of this suggests that sexual victimization is highly prevalent among this population, but it remains unknown how the understanding of one's sexual orientation may be impacted by sexual victimization. Substance use, which was also highly prevalent in our sample (Riley et al., 2014), has also been shown to be related to a greater number of sexual partners (Wenzel et al., 2006), and thus may have also influenced sexual behavior and/or understanding of sexual orientation. Conversely, homeless or unstably housed women living with HIV/AIDS who are aware of their status may be more likely to abstain from sexual activity (Courtenay-Quirk et al., 2009). Lastly, the sexual identity development of African-American women may differ from their White/Caucasian counterparts (Bates, 2010, 2012), and a large proportion (43.3%) of our sample was African-American. In sum, women's sexual behavior, as well as their own understanding of their sexual orientation, may be influenced directly by poverty needs related to food, housing, or other resources. Relatedly, victimization, substance use, HIV status, and race, among other factors, may also be related to sexual orientation as it was understood among our sample.

Over the entire 3 year study period, 39.7% (n=119) of women were sexual minority as defined by either identity or behavior at one or more time points over the 3 year study period. This is a far greater percentage than those reported from population estimates, which typically report 3.5% of persons who endorse sexual minority identities, and 8.2% who engage in same-sex sexual behavior (Gates, 2011). The difference may be due in part to a greater representation of sexual minority people among those experiencing homelessness in San Francisco (Flentje et al., 2016) and other areas within the United States (Corliss et al., 2011).

Future Directions

The purpose of this study was to determine how to best quantify sexual orientation over time, taking into account changes in sexual identity and behavior, among a sample of unstably housed women. Our insight into this phenomenon was expanded due to the fact that we could compare measures of sexual identity and behavior at 7 time points over three years. Considering the substantial proportions of sexual fluidity observed within this sample, as well as the significant percentage of sexual minority women who would have been missed by a single measure of sexual orientation at a single time point, our study indicates that it is worthwhile to test and use measures that adequately capture the multiple dimensions of sexual orientation over time throughout the lifespan. As this study focused on a sample of unstably-housed women, more research is required to understand how risk profiles (homelessness, drug use, etc.) may be better understood through various measures of sexual orientation. For example, estimates of mental health risk related to sexual minority status have varied across studies depending upon how sexual orientation is measured (McCabe et al., 2009). Other studies of men have shown correlations between sexual identity change and better mental health (Stokes, Damon, & McKirnan, 1997), suggesting that change itself may be important to measure. Examining how fluidity or stability may be related to risk or resilience is an area of further study. While we did not examine health risks within this study, the work here documents the dynamic nature of sexual orientation among women experiencing housing instability and lays the groundwork for incorporating sexual orientation into complex systems approaches to health. Future inquiry may also examine why unstably housed women may change their sexual behavior and identity. This line of inquiry may help to identify external factors that may have impacted these changes.

Limitations

The way in which sexual orientation was measured within this study had inherent limitations. Specifically, as the study from which these data were derived was designed to answer questions related to HIV and risk, sexual behavior with men in the previous 6 months was measured, and sexual behavior with women was inferred from the reporting of sexual partners who were not men. Participants may have also been reporting on sexual activity with individuals with non-binary gender or who were transgender. Thus, interpretation of results involving sexual behavior with women must be tempered with this limitation. The baseline measurement also only accounted for sexual behavior in the previous 6 months; thus a question querying lifetime sexual behavior may have resulted in different responses. Moreover, the use of two questions (number of sexual partners and proportion of male partners) as opposed to a timeline followback to record six months of sexual behavior may have been subject to greater recall bias, with respect to the number or gender of partners, particularly in a sample experiencing a high proportion of psychiatric disabilities and substance use. In addition, limiting the measurement of sexual identity to three categories (heterosexual, bisexual, and homosexual/lesbian) may fail to capture the gradients of identity in the sample. For instance, in a sample of undergraduate university students, McCabe, Hughes, Bostwick, Morales, & Boyd, (2012) found that when given both options, approximately a third of people identifying as bisexual under a three-category measure chose either mostly heterosexual or mostly lesbian/gay under a five-category measure. Findings such as these suggest that the existing taxonomy may be insufficient to

capture how individuals would ideally self-identify. We might have observed increased consistency between identity and behavior in this sample had the identity options been more granular. On the other hand, our sample may not have been large enough to support the statistical power needed for additional categories. Our study also did not offer an option for people to select asexuality, which may have been informative to our results. Another potential limitation was that the examples that followed the forced choice identity labels, may not have accurately captured every individual's experience, and thus may have changed the ways that people identified. While the intention of providing additional information after sexual orientation labels was to provide standardized guidance to a diverse cohort of participants who may not have understood identity labels (as described in Badgett, 2009), we recognize that this became a limitation of our study. Recommendations published after we initiated this study provided guidance to avoid these additional descriptors after identity labels (Badgett, 2009). We also did not include a measure of sexual attraction, which would be informative in future research. Despite this, the identity labels of sexual orientation presented first in questions within this study are similar to recommendations from the Williams Institute on the measurement of sexual orientation (Badgett, 2009). We were also unable to capture the degree to which congruence between identity and behavior was of importance to our participants, thus some people may have selected identity labels based on their sexual behavior, while other people may have selected identity labels irrespective of their sexual behavior. Our study was also limited in that gender identity was not assessed for this sample, thus while the sample consisted of women assigned female sex at birth per recruitment criteria, there may have been transgender individuals assigned female sex at birth. We also lacked a comparison group of stably housed women for our sample, thus we cannot conclude how our sample may be different from women who are stably housed. Furthermore, while extensive efforts were made on this study to identify a representative population of homeless and unstably housed women, the overrepresentation of women living with HIV within our sample should be considered when generalizing our results to homeless and unstably housed women. Given the differences in social context experienced by homeless and unstably housed individuals, results presented here may not be generalizable to women from the general population. Future studies considering multiple dimensions of sexual orientation over time will provide further clarification.

Conclusion

Within this study, we found that many sexual minority women within longitudinal studies would be missed if only a single time point measure of sexual identity or a latent class analysis utilizing identity and behavior is used. Additionally, sexual identity changed in 16.3% of unstably housed women over a 3-year study period. The patterns of changes in sexual identity and sexual behavior, and the interplay between them, indicate that a sizeable portion of this population experiences sexual fluidity. Data presented here suggest that including multiple dimensions of sexual orientation and doing so over time will be the best way to integrate this important factor in complex systems approaches to individual and population health.

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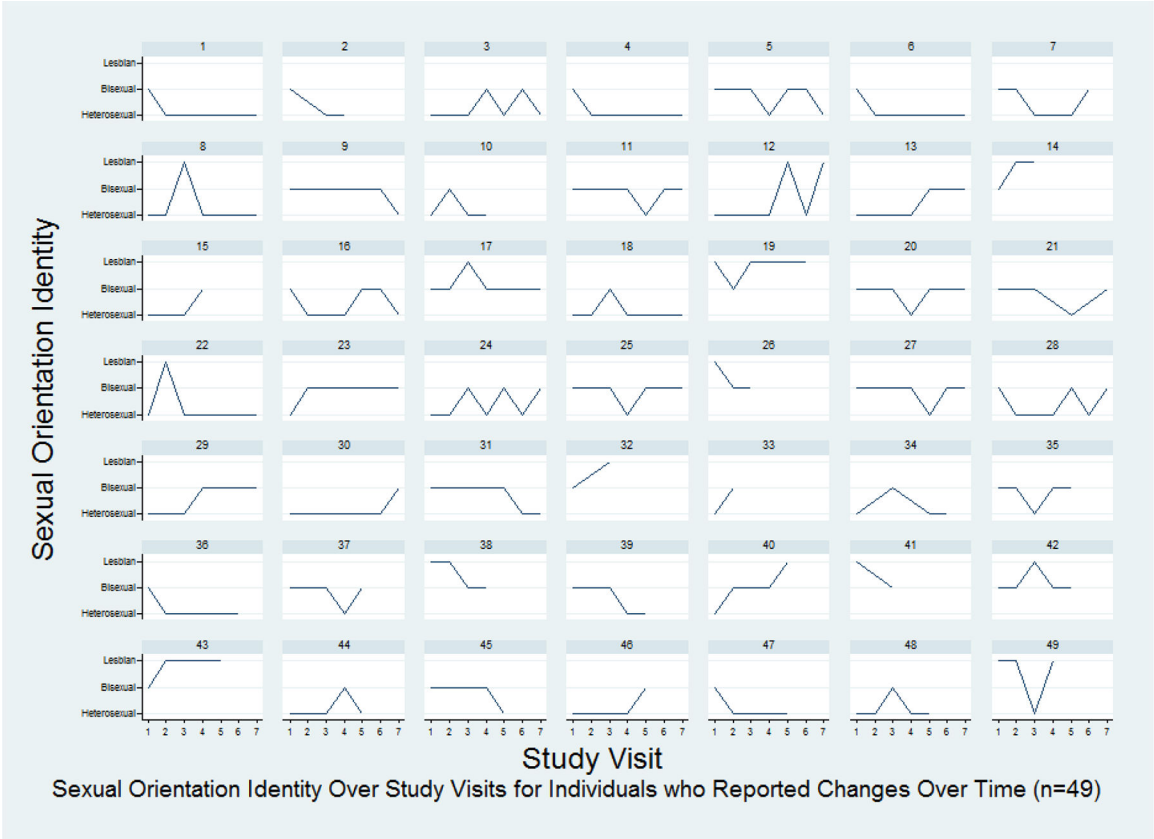
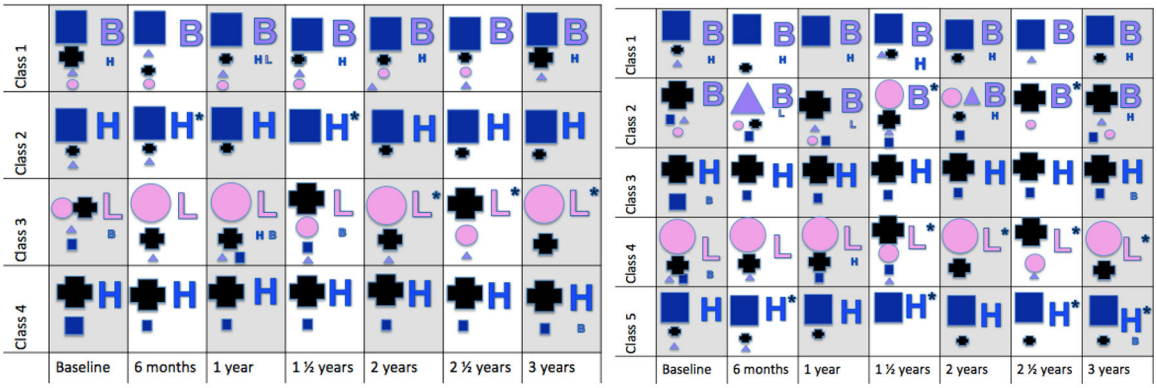


Figure 1.

Patterns of change in sexual orientation identity reported among the participants (*n*=49 out of *N*=300) who reported changes over time



2a 2b

Figure 2 summarizes the sexual identity and behavior of the participants within each of the latent classes at each of the 7 time points. Figure 2a summarizes the 4 class solution, while figure 2b summarizes the 5 class solution.

Sexual identity

L: lesbian identity B: bisexual identity H: heterosexual identity

Sexual behavior in previous 6 months

: male partners only : female partners only : male and female partners : no sexual partners

Large symbols represent that *most* individuals within the class endorsed this identity or behavior, medium symbols indicate *more than 25%* of individuals within this class endorsed this identity or behavior, small symbols indicate *that at least 5%* of individuals within this class endorsed this identity or behavior. Symbols appear from top to bottom in the order of frequency with which the category was endorsed.

*Indicates all individuals within this class endorsed this identity.

2a: 4 class solution: class 1: primarily bisexual identity, sexual behavior from all categories; class 2: primarily heterosexual identity, sexual behavior primarily with males; class 3: primarily lesbian identity, sexual behavior primarily with females; and class 4: primarily heterosexual identity, primarily reporting no sexual partners.

2b: 5 class solution: class 1: primarily bisexual identity, sexual behavior primarily with males; class 2: mostly bisexual identity, sexual behavior from all categories; class 3: primarily heterosexual identity, primarily reporting no sexual partners; class 4: primarily lesbian identity, primarily reporting sexual behavior with women or no sexual partners; and class 5: primarily heterosexual, sexual behavior primarily with males.

Figure 2.

Sexual Identity and Behavior within 4 and 5 class solutions of latent classes produced by latent class analysis of sexual identity and behavior of 300 women across 7 time points over 3 years.

Table 1.

Baseline characteristics of homeless and unstably housed adult women living in San Francisco, CA (*N*=300) by sexual orientation

		Identity at baseline			Sexual behavior at baseline			
	Total (*N*=300)	**Heterosexual (*n*=228)**	**Lesbian (*n*=22)**	**Bisexual (*n*=50)**	**Men only (*n*=182)**	**No partners (*n*=87)**	**Women only (*n*=12)**	**Men and women (*n*=19)**
Age *M* (*SD*)	47.50 (8.51)	47.72 (8.45)	47.41 (7.57)	46.48 (9.19)	45.84 (8.54)	51.27 (7.13)	45.87 (7.91)	46.91 (9.78)
Race *n* (%)								
African American	130 (43.33%)	101 (44.30%)	8 (36.36%)	21 (42.00%)	85 (46.70%)	32 (36.78%)	8 (66.67%)	5 (26.32%)
Asian/Pacific Islander	10 (3.33%)	8 (3.51%)	0 (0.0%)	2 (4.00%)	7 (3.85%)	3 (3.45%)	0 (0.0%)	0 (0.0%)
Hispanic/Latino	15 (5.00%)	11 (4.82%)	1 (4.55%)	3 (6.00%)	6 (3.30%)	8 (9.20%)	0 (0.0%)	1 (5.26%)
Multiracial/Other	55 (18.33%)	37 (16.23%)	5 (22.73%)	13 (26.00%)	33 (18.13%)	13 (14.94%)	3 (25.00%)	6 (31.58%)
White	90 (30.00%)	71 (31.14%	8 (36.6%)	11 (22.00%)	51 (28.02%)	31 (35.63%)	1 (8.33%)	7 (36.84%)
Income in previous 6 months *M* (*SD*)	1120.77 (1143.66)	1083.41 (1234.66)	1434.94 (858.68)	1171.34 (718.36)	1104.13 (1378.95)	1098.15 (609.65)	1468.36 (883.65)	1142.36 (466.02)
Heterosexual	--	--	--	--	156 (85.7%)	63 (72.4%)	0 (0.0%)	9 (47.4%)
Lesbian	--	--	--	--	3 (1.7%)	7 (8.1%)	9 (75.0%)	3 (15.8%)
Bisexual	--	--	--	--	23 (12.6%)	17 (19.5%)	3 (25.0%)	7 (36.8%)

Table 2:

Fit indices for latent class analysis using sexual behavior and identity across 4 time points to classify 300 unstably housed women living in San Francisco, CA participants based on sexual identity and behavior

BIC	Entropy	Class 1 *n*	Class 2 *n*	Class 3 *n*	Class 4 *n*	Class 5 *n*	Class 6 *n*	VLMLR	Bootstrap
5478.88		300							
4497.81	.98	235	65					0.000	
4224.41	.92	64	137	99				0.752	.000
4045.50	.93	43	136	23	98			0.758	.000
4127.43	.93	26	21	98	20	135		0.766	.000
4250.68[a]	.94	22	26	10	135	98	9	0.447	.013

[a]Best log likelihood was not replicated for this model